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PRINCIPAL INVESTIGATOR: Robert Roach, Ph.D.

CONTRACTING ORGANIZATION: The University of Colorado
Aurora, CO 80045

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Robert Roach, Ph.D.

E-Mail: robert.roach@ucdenver.edu

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14. ABSTRACT

After obtaining all necessary approvals, the data collection phase of this project was started and finished in 2012. We recruited and tested subjects at the University of Oregon, prepared the fieldwork sites in Bolivia, transported all equipment and all people successfully to Bolivia where we completed the protocol on 23 research subjects. Total data collected, including the physiology and OMICS data encompasses about 40 million data points. Since returning from Bolivia on September 15th we have been working non-stop on data analysis and manuscript preparation. The study was designed to yield a relatively quick turnaround for the core physiology studies, and a slightly slower but nonetheless fast turnaround for the OMICS analyses. As of January 15th, four months after completing the expedition, six of the physiology papers are drafted with the expectation of submission for publication by February 15th. On the OMICS side of the experiment, we did a two-step analysis process where data for gene expression, epigenetics and microRNA were analyzed for 10 subjects to a) verify that the samples we collected were viable and b) to identify the relative importance of various time points. That work was completed by late November. All samples tested to date were of very high quality, and significant signal existed at all major time points in the study suggesting that when the OMICS dataset is complete, we will have major new findings. Completion is expected in the next two weeks.

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INTRODUCTION:

The goal of this project is to advance high-altitude medical research by discovering the basic molecular mechanisms of acclimatization and de-acclimatization that protect soldiers from high-altitude illness.

BODY:

In this second year we caught up on the small delay we incurred during the first year waiting for HRPO approval and are fully back on schedule. We have accomplished most of the tasks outlined in the statement of work for months 1-24.

- We have obtained all IRB approvals
- We recruited and screened subjects and implemented the exercise training protocol
- We prepared the Bolivian field work sites and logistics and conducted the field study in Bolivia.
- We then started and finished all sub-protocols for field data collection, including Pre-Acclimatization Protocol, Physiological Markers of Acclimatization Protocol, Molecular Mechanisms of Acclimatization Protocol, High Altitude Acclimatization Protocol
- We also started and finished all sub-protocols for Specific Aim 2: The Persistence of Acclimatization on Return to Low Altitude, including Physiological Markers of the Persistence of Acclimatization and Molecular Mechanisms of the Persistence of Acclimatization.
- Since September 15th we have begun to implement the optimized plan for all AltitudeOmics data analysis. Given the fact that we have generated more than 40 million data points, this has been of critical importance.
- We have drafted the first six papers from the physiology portion of this study and expect to submit them for publication by February 15th.
- OMICS data analysis will be complete by 1 March, and the first two papers on epigenetics and microRNA responses to acclimatization will be submitted by June 1.
- Although we are on time or ahead with all milestones, the combination of the enormous effort of this field expedition by our laboratory, and a delay in gaining HRPO approval on our other DOD-TATRC funded study to predict acute mountain sickness led us to request a No Cost Extension for this project for 2013-2014.

KEY RESEARCH ACCOMPLISHMENTS:

1. Completed the first ever measurements of acute mountain sickness, cognitive function and exercise capacity after 7 and 21 days of de-acclimatization. The results suggest near complete retention of acclimatization after 7 days de-acclimatization, and about 70% retention after 21 days. This key finding will be used in the OMICS analyses to help identify factors that occur with acclimatization, and are still present after de-acclimatization.
2. Within four months of returning from a four month-long expedition, six research papers are near completion on the physiology of human acclimatization to high altitude.

REPORTABLE OUTCOMES:

1. Completed all regulatory steps to gain approval for this multi-site, multi-nation study.
2. Safely completed data collection on 23 young healthy student volunteers, and safely transported and cared for them and 40 scientists to/from Bolivia.
3. Half of the OMICS data have been analyzed and the quality of the collected samples is very high. The rest will be analyzed in the next two weeks.
4. Additional samples for analyses of metabolomics, proteomics, cytokines, nitrite/nitrate and many other blood biomarkers were successfully shipped from Bolivia to Denver and are currently undergoing analysis.

CONCLUSION:

Humans retain acclimatization after 7 and 21 days of de-acclimatization. This was a key hypothesis of the study. Yet to be determined is what are the OMICS responses that can be linked to the process of gaining acclimatization, and its retention on descent to low altitude?